CUBIT Capability Proposal

Technical Area Geometry, Meshing, Infrastructure, GUI, Graphics, etc..	**Technical Lead** Cubit Developer in charge of technical area
Meshing	Matt Staten

MRD Description
Describe the capability in terms of how a user would see it.

4.5.0-1: Improve the efficiency and robustness of the 3D quad meshing algorithm in CUBIT
4.5.0-2: Improve performance and robustness of quad meshing by providing an alternative parametric (2D) meshing algorithm
4.5.0-3: Fault Tolerant: Quad mesher should be able to mesh over or ignore poorly defined or small features in the solid model.
4.5.0-4: Paver should handle large transitions in sizes

SRS Description
What needs to be done by Cubit developers to implement this capability? Break the tasks into steps if applicable. (Steps should be on the order of 2 man-weeks or more)

1. Design a family of "pavers" that simplify the current code base
2. Implement pavers for planar and non-periodic parametric surfaces
3. Implement more efficient intersection checking using facets and material "color"

Justification
Describe why this is important and what impact it will have if it is implemented. (or not implemented).

Unstructured quad meshing using the paver is a Cubit strength. Over the years, the paver has become brittle, small changes have unintended consequences. Thus, the paver is difficult to maintain. The above requirements from the MRD show that there is need to increase the efficiency and robustness of the paver. This project is intended to address those issues by developing a class of pavers from very simple to complex. The objective is to tailor the paver to the application. Planar surfaces do not need the complexity associated with a curved surface. In fact, most parametric surface should not require much additional code. Therefore, only the paver complexity necessary for each problem type will be included in each subclassed paver. Improved intersection checking, on a facet background mesh, will color regions so that points may be rapidly classified as being within the currently advancing front or in a previously meshed or invalid open region. This will be the first in a series of paver revitalization projects.

Resources Who will work on this	**Time estimate** How much time will it take in man-weeks	**Targeted Release** 10.2 (August 06), 10.3 (March 2007), 10.4 (August 2007), Future (beyond FY07)
Michael Stephenson	12 man-weeks	10.2 and beyond

Submitted By:	**Date:**
Michael Stephenson	3/27/2006